I. C. 7097 DECEMBER 1939

UNITED STATES
DEPARTMENT OF THE INTERIOR
HAROLD L. ICKES, SECRETARY

BUREAU OF MINES
JOHN W. FINCH, DIRECTOR

INFORMATION CIRCULAR

STRATEGIC MINERALS INVESTIGATIONS

PROCEDURE FOLLOWED BY THE BUREAU OF MINES

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BY

JOHN W. FINCH

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

STRATEGIC MINERALS INVESTIGATIONS

PROCEDURE FOLLOWED BY THE BUREAU OF MINES[1]

By John W. Finch[2]

WHAT IS AUTHORIZED

The Secretary of the Interior acting through the Bureau of Mines and the Geological Survey is authorized by the Strategic Materials Act (Public No. 117 - 76th Cong., Chapter 190, 1st Sess.) to make investigations concerning essential minerals of which the quantities or grades obtainable from known domestic sources are inadequate.

The Bureau of Mines, in carrying out its part of this program, may investigate deposits of such minerals in whatever manner may be necessary, in order to determine (1) the extent and quality of the ore, (2) the most suitable method of mining and beneficiating it, and (3) the cost at which it may be produced. The essential objective in doing these things is to determine where and how supplies of minerals and metals of which domestic production is usually inadequate might be obtained in a national emergency, even though at higher cost than usual.

The Geological Survey extends or renews its studies of mineralized areas, including those selected by the Bureau of Mines for investigation, recommends deposits of which it already has knowledge, and advises the Bureau of Mines with respect to all geological aspects of the investigations.

The Procurement Division of the Treasury Department, Washington, D. C., is the agency authorized to make all purchases of minerals, metals, and other strategic materials required by the Government. Those who desire to sell minerals or metals to the Government should therefore apply directly to the Procurement Division, not to the Bureau of Mines. The Bureau has nothing whatever to do with the part of the Act that authorizes purchase of minerals or metals to be warehoused or stockpiled as reserves for use only in a national emergency.

1/ The Bureau of Mines will welcome reprinting of this paper provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7097."

2/ Director, Bureau of Mines.

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WHAT IS NOT AUTHORIZED

The Bureau of Mines is not authorized to purchase mining properties, to operate them, or to render financial assistance to prospectors, owners, or operators of mines; and no compensation or gratuity is paid for information leading to the discovery of mineral deposits. The Bureau does not make assays or analyses of ores to save the public the expense of having them made by commercial assayers or chemists, or examine mines upon request to save their owners the cost of examination by mining engineers. Neither the Bureau nor any employee is authorized to make any request of owners or operators of properties to perform any work or incur any expense for the benefit of the Government in expectation of reimbursement or of recovery of damages therefor, unless the request is evidenced by a contract, signed by the Director and the other party concerned, specifying what is to be done and its cost.

METALS SOUGHT

In its Strategic Minerals Investigations the Bureau of Mines is chiefly concerned at present with seven metals, all of which have been designated as of strategic importance by the Secretaries of War, the Navy, and the Interior upon advice of the Army and Navy Munitions Board. They are: Antimony, chromium, manganese (ferro-grade), mercury, nickel, tin and tungsten. Investigations of other metals and minerals whose strategic importance is less pronounced must be deferred to a later year of the Strategic Minerals Program.

MANGANESE

In explanation of the term "ferro-grade" applied to manganese, it should be stated that manganese ore comprises four very different raw materials, determined by grade and quality, as follows:

(1) Exceptionally high-grade manganese ore characterized by a high content of MnO_2 is used in making batteries. It commands the highest unit price and is known as battery ore.

(2) At the other extreme is manganiferous iron ore, usually containing 10 percent or less manganese; it is used for making manganiferous pig iron. The domestic supply of such ore is so abundant that the manganese it contains is usually paid for as if it were iron.

Between these two extremes are the ores, low in iron, that are suitable for making ferromanganese and those high in iron used for making spiegeleisen, although some of it also is used for making pig iron.

(3) For making ferromanganese the ore usually contains at least 45 percent manganese but averages 48 percent; and the ratio of manganese

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to iron is not less than 7 to 1, though it usually is 8 to 1, while there must be low silica (ranging from 7 to 10 percent) and very low phosphorus (ranging from 0.12 to 0.2 percent). Only manganese ore of this character has been designated as a strategic mineral because domestic production is inadequate.

(4) Ore in which the manganese-iron ratio is too low for making ferromanganese can be used for making spiegeleisen. Of such manganese ores, high in iron, there is no deficiency, and a relatively low price is paid for the manganese they contain. Although an excess of silica often can be remedied by gravity concentration, iron is difficult to remove by that means because the specific gravities of iron and manganese oxides are so nearly the same.

CHROMIUM

Chromite ($Cr_2O_3 \cdot FeO$), the commercial source of chromium, has three major uses: (1) For making chromium-steel alloys, (2) for making refractories, and (3) for making chemicals. The first two account in nearly equal degree for over three-fourths of the consumption of chromium. Excess of iron is detrimental in both of these uses. A minimum chromium-iron ratio of about 3 to 1 is required for metallurgical uses and high iron renders refractories less resistant to heat and corrosion. The usual requirement as to grade is Cr_2O_3 48 percent, maximum sulfur 0.5 percent, and maximum phosphorus, 0.2 percent. Silica usually is limited to 5 percent. In the United States there is much chromite containing high iron, but there is a dearth of known deposits of high-grade chromite.

BUREAU OF MINES INVITES INFORMATION

The Bureau of Mines welcomes statements of fact as to the nature and situation of deposits containing any of these seven metals. Especially welcome are facts that are specific as to deposits believed to contain the strategic metals in substantial amounts. Merely small showings of ore, however rich, are of less interest than large deposits appearing to contain considerable tonnage of metal, even though the ore may be so relatively low in grade that it would not usually be mined at a profit.

To assist in obtaining facts that will be most helpful to the Bureau a simple, brief form is available for the use of any who request it.

EXAMINATION OF PROPERTIES

Properties indicated by data available to the Bureau as of possible interest will be visited by its examining engineers to confirm and extend information in regard to them. As there are thousands of properties that should be seen eventually, it is necessary to route these engineers systematically to conserve time and minimize expense. Therefore it will not

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be practicable to make special examinations in response to solicitation. Neither will the examining engineers conduct regional searches to discover unknown deposits or to investigate formations as such, the latter being a function of the Geological Survey. They will be concerned chiefly with individual properties upon or within which, as shown by outcrops, mine workings, trenching or drill exploration, substantial deposits or ore are presumed to exist.

SELECTION OF PROPERTIES FOR EXPLORATORY PROJECTS

Selection of properties for the conduct of exploratory projects upon them will be made from those that appear from preliminary examination to promise most with respect to the national objective, without regard to their geographical situation. No allotments will be determined by State or other geographical boundaries, as this would defeat the purpose of the Act.

In general, properties likely to yield only small, rich ore bodies will not be selected, as the cost of exploration would be excessive in proportion to the tonnage of metal that might be derived from them. Preference will be given to properties whose ores appear to be subject to concentration into an acceptable product of which a large tonnage might be disclosed by systematic exploration, especially by drilling. With respect to such deposits there is no presumption that they should prove to be commercial in ordinary times. It is the scarcity of commercial deposits of these minerals that has caused them to be declared strategic. The hope is to find marginal and moderately submarginal properties that may nevertheless yield substantial tonnages under circumstances in which the cost of production would not be of major importance.

CONDUCT OF PROJECTS

Available funds are only adequate to permit the conduct of about eight projects at a time. The consent of owners of the properties selected must be obtained before work upon them is begun. No stipulation as to the work to be done is made, and no work is undertaken by request or for the purpose of benefitting the owner. Neither will any report be supplied for use in promotion. The only undertaking by the Bureau of Mines is that of providing a copy of any assay charts made in order that the owner may be informed as to values and widths of ore disclosed by the investigations.

All sampling on projects is done with extreme care, large samples being shipped to a metallurgical laboratory of the Bureau for reduction, analysis, and the conduct of beneficiation tests. If commercial ore is found it is the privilege of the owner to mine it, as no reservations are made to retain any control of property by the Government. Neither is the owner of a property investigated subject to any charge for any benefit he may happen to receive, although he is expected to grant free access to

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all parts of the property for purposes of sampling and to permit the use by the Bureau during the conduct of its investigations of any equipment he may have available on the property, not essential to his own operations.

OBJECTIVE OF INVESTIGATIONS

The objective of these investigations is unusual, in that they are not concerned primarily with the commercial possibilities of the deposits; a reorientation from the normal approach to mineral exploration is thus required. It is not to be supposed that large deposits of commercial promise have been overlooked by private enterprise; but private industry has no incentive to develop submarginal or even marginal ores. It is known that some large deposits of this character have been explored only superficially, and it is probable that there are many others. Deliberate investigation of these deposits, while time permits thorough exploration and the development of methods best suited to their beneficiation and processing, will save much confusion, inefficiency, and waste of time and money in the actual event of a national emergency.

In some circumstances even negative results of investigations would prove of great value because definite proof that specific deposits could not be relied upon as sources of supply at any price would aid in determining what should be stocked in advance of an emergency and also to show what research for the development of substitutes is necessary. Insistence of owners that certain deposits contain large resources, in spite of virtual proof to the contrary, has created in some minds a false sense of security regarding emergency protection. Some properties of this kind will doubtless require investigation now in order that in an actual emergency the facts in regard to them may be well understood.

In effect, the Government desires to know definitely its natural resources of the several strategic minerals--the tonnage, grade, quality and rate at which production can be maintained--as well as the cost of mining and beneficiating the minerals to provide a usable product. Such information is obviously necessary for intelligent planning of national defense and meeting industrial needs if our usual supplies of imported minerals should be cut off through interruption of sea-borne trade.

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